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No. 8

The Agricultural Student

WASTE LANDS IN OHIO—
THEIR CAUSES AND CURES

by Dr. Geo. D. Hubbard



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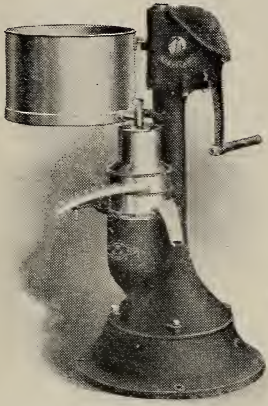
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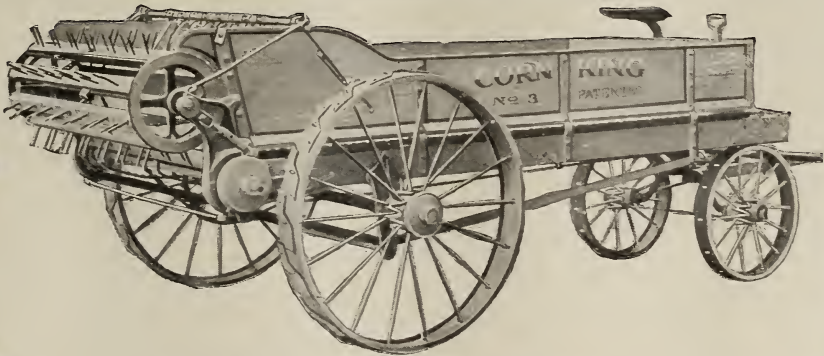
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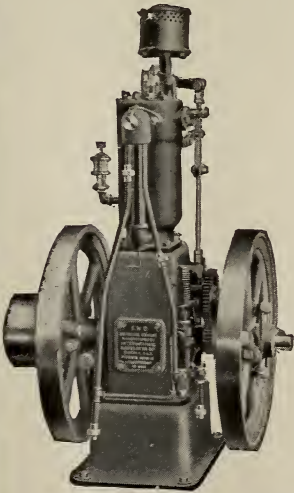
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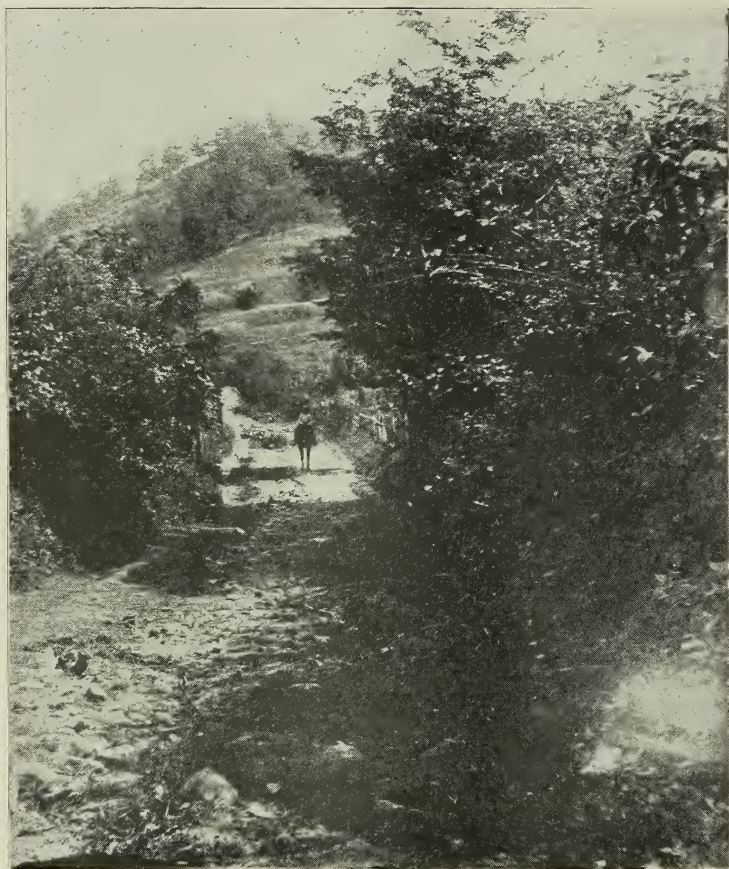
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Hills of Southeastern Ohio

THE AGRICULTURAL STUDENT.

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OHIO STATE UNIVERSITY, COLUMBUS, MAY, 1908

No. 8

WASTE LANDS IN OHIO—THEIR CAUSES AND CURES¹

By Dr. George D. Hubbard

Of the Department of Geology

[Read before the Ohio State University Horticulture and Forestry Club.]

There are in Ohio many areas of land, now to all intents and purposes waste land, because, in most cases, the owners understand so little of the principles of physiography and geography as to know neither wherein lies the difficulty nor the possibility of redeeming the land. True, in a number of cases, redemption to ordinary agricultural uses is practically forbidden by the geographic conditions, or else comes at so high a price that it will not pay. A study of these waste lands to find their causes and cures is a very practical, economic geography question because they are widespread, abundant and, if reclaimed, valuable.

To know how to deal with them one must understand them—causes, conditions, effects and how to cure, or master them. These four items form a chain the last link of which attaches to the dollar, and the second link of which is the door to the situation. This paper essays to describe and classify the waste land areas, to explain their existence, and to point out some of the remedies which may be applied.

In almost every instance of waste land in Ohio, the present neglected condition is due to an excess of something. Many patches are too wet, oth-

ers too sandy or too stony, and others too steep. While the above classification is somewhat arbitrary, it throws together those areas whose reclamation is to be somewhat similar and hence will be followed in this discussion.

Areas with Excess of Water.

Lands belonging in this category are extensive and are due to a variety of causes. Flood plains along many of the old streams in eastern Ohio are now often much too wet. An excellent type illustration may be found along Killbuck Creek, northward from the Wallhonding in both Coshocton and Holmes counties. In these counties vegetation has been allowed to grow up along the stream and in the nearby lowlands, thus checking the flow of the water, especially in flood, and preventing evaporation; while upstream in Wayne county and over the hills in Coshocton and Holmes counties the timber has been cleared off almost completely and everything possible has been done to hasten the drainage water down into Killbuck. The result is most disastrous to all industries along the main valleys. With every rain, and especially with the greater ones, the main valley is quickly overflowed; but it takes days for the water to get away down the stream. Other examples of this type may be found in many places in hilly Ohio. The cure

¹By permission of the State Geologist of Ohio.

is in a reverse action. Reforest all the steeper slopes and thus check the run off from the hills, then clear and straighten the main stream. Both clearing and straightening have been begun in Wayne county somewhat to the detriment of farming in the lower counties. This work should be carried on down to the Walhonding.

There are many miles of carefully laid out canals in the State, now fallen into absolute disuse, which should have their water diverted and the land leveled down and thus redeemed to cultivation.

Ohio is favored with thousands of square miles of lake bottom plains, much of which is in very excellent condition. But in a number of areas such plains are largely waste land because of excess of water. South of Chippewa Lake to Creston, and then eastward to Rittman is one of these lake bottom plains, part of which has been drained by dredge and tile. Just north of Orrville is another small one, west and southwest of Wooster is another larger lake bed, and in the southwestern part of the same county is a fourth.² These plains are mainly of clay and, being level, are difficult to drain. A deep dredge ditch with shallow tile laterals, will redeem to agriculture most of this rich cultivable soil. These lake plains are here because the region was glaciated and because the large valleys were partially plugged with moraine at one or both ends. Many minor valleys are similarly laid waste.

In the drift sheet of the western half of the State are multitudes of shallow sags, in which water accumulates and lies until it evaporates, because the streams have not yet, in post-glacial time, had opportunity to push their headwaters back and drain the sags,

and because the till largely of clay is too compact for the water to soak down. Where the sags are neither too deep nor too far removed from lower valleys, tile drains can redeem them. Given time enough the streams will drain them all as they have on the older drift sheets of Hamilton and Butler counties. Examples of this sort of waste land in patches of one to one hundred acres are common from the Wisconsin moraine, near Chillicothe and Xenia northward to the ancient lake shore-lines. Several may be seen within three miles westward from Columbus along the Lane avenue road. Moraine kettles in most of the better-marked moraines should also be put in this class.

Along the Erie shore-line are many shallow bays, among which probably Sandusky Bay is the largest. These have a depth of 0-7 feet and are floored by rich lacustrine soils, but at present are too well watered. They are due to a slight progressive tilting of the lake basin so as to raise the northern rim and lower the southern, causing the lake to spill over at all the low places along the south side. Owing to the fact that the movement which produced them is still in progress to perpetuate them, their redemption is a very difficult task. A dike to exclude any more water and wind or gas pumps to remove the present surplus, Holland fashion, might be feasible, but constant redemptive processes must here be employed.³

Modern mining methods have been the excuse for considerable overwatered or poisoned lands in this State. Water impregnated with iron or sulphur, or surcharged with coal dust

³ Professor Herbert Orborn in a forthcoming number of the Popular Science Monthly will show how many of our ponds and marshes can be profitably utilized in a system of aquatic farming. His suggestions are very timely and practical.

²Am. Jour. Sci. N. S., Vol. XXV, p. 2391 (1908).

from the tipples spreading out over portions of nearby flood plains ruin them for agriculture and cast them into the list of waste lands. Of course, their reclamation rests in the closing of the mines or in other disposition of the water.

Areas Neglected Because Too Steep.

The slopes lying waste are genetically of two general classes: (1) Those of rock, and (2) those of glacial drift. In eastern Ohio, the unglaciated part, from Holmes and Harrison counties to the Ohio River, the country, when first settled, was mostly timbered. The lowlands, and the uplands (i.e., leveler hill summits) were early cleared for agricultural purposes, and in the last generation, under the pressure of increased demand and higher prices of timber, the intermediate lands, often too steep for profitable cultivation, have been cleared for the wood they could furnish. This exposes them to rapid erosion either by little rills or surface wash, and they are soon gullied or swept of their soils. From a physiographic point of view, these slopes are said to be in a stage of youth, or sub-maturity, and the natural thing to do to redeem them (that which many seem to be inclined to do), is to wait for them to pass into greater maturity, and thus become gentle slopes that will not wash; but this will occupy years—ages—during which the land will continue profitless. Therefore, the only wise course to pursue is to promptly reforest all slopes, too steep for cultivation, with valuable woods and thereby redeem them to profitable uses.

In the glaciated part of Ohio many of the streams have cut down into the glacial deposits so far that young, steep-sided, often deep valleys have been formed. These valleys are, al-

most universally, becoming deeper every year because they are still far above base level. Slopes of such valley sides being of drift are easily washed, gullied and spoiled for culture if left without a permanent vegetation cover. Some of them have never been forested; others once were, but have subsequently been deforested and left, or put under unprofitable culture. None of them are extensive, but all are worth reclamation; and that can be accomplished by planting to profitable trees, such as nuts, post wood, cross-tie timber or suitable hardwoods for furniture, vehicles and farm machinery, all of which are made and used in great abundance all through this western half of Ohio. No large timber areas could be made by reclaiming these steep drift slopes, but each farmer having such land could have a little timber.

Both of these last classes of waste land, steep rock slopes and steep till slopes, are subject to land slides, conspicuously more so when not forested; and when their soils and subsoils have been mixed and jumbled by landslides they are seriously damaged for culture. Thousands of acres of land on such steep slopes in southeastern Ohio are now waste, for no other reason than because they possess **landslide topography**. A little leveling and then tree planting would put them in line to yield a crop. Ohio ought to be producing several crops beside cereals, grass, stock and fruit.

Areas Too Stony.

Land of this class is fortunately rare in our State. It will become more abundant if many slopes in the hilliest counties are not soon cared for, and erosion checked. The steepest slopes of the last reviewed kind are usually bare rocks. Their redemption is mainly

a problem of waiting until the talus covers them. Let the timber take possession of the talus slope as fast as it is in place, and divert the valley streams, where not too large, away from the steep rocky bluffs and out into mid valley so they cannot undercut and thus perpetuate the steep rocky slope.

We have but few acres in Ohio which are waste because possessing too many glacial boulders. A few sections in western Champaign county have recently been cleared of an excess of boulders by dynamiting them and then hauling the pieces to the fence rows. In the matter of stony moraine and boulder trains we are far more fortunate than our neighbors in states with harder bed rock.

We have a number of rather steep hillsides, partly waste because of sliding or creeping native rocks. These occur only in the unglaciated part of the state and are not necessarily steep but owing to the huge local boulders cannot be cultivated.

Areas with an Excess of Sand.

These can all be traced to one of two causes, (1) the nature of the underlying rock, and (2) the ice invasion during the recent glacial period, with various resultant phenomena.

Much of the hilly part of Ohio is immediately underlain by strata, more or less sandy in nature (Mississippian in age) around the northern and western margins of the hilly area, and Pennsylvanian in the coal-bearing counties). Because this area has generally not been glaciated there has been no means of mixing foreign soils, clays and rock flour with the local residual sand, and therefore where the bed rock is sandiest the rock mantle is principally sand. To such a degree is this true that considerable areas in

Licking and Perry counties and others southward have hilltops mantled with soil too sandy for most cultures. I find some peach orchards being planted on these and have wondered if beech, chestnut and possibly some pines could not be persuaded to take possession of this otherwise undesirable land.

Down valley from a number of valley dependencies of the continental glaciers, and along other lines of drainage from the waning ice sheet are strewn plains of sand and gravel known as outwash plains or valley trains. The upper bottoms of the Scioto from Chillicothe southward, many upper bottoms or terraces along the Ohio, and some along the Muskingum and Hocking, belong to this class as well as the extensive plains along the Miami and its obverse branches, the Stillwater and Mad Rivers and the Little Miami. Very little physiographically can be done to improve these areas. Their usefulness of course is limited to certain crops capable of growing on soils of this character, with too perfect under-drainage. Tobacco, some varieties of potatoes and possibly some trees have proven their ability on these terraces.

Recent beaches along Erie and other smaller lakes are often of almost pure sand, and owing partly to their chemical composition and partly to their mobility have never acquitted themselves of the charge of unfruitful. Their profit attaches mainly to their juxtaposition to the waters and their consequent value for recreation, pleasure, fishing, etc.

Ancient beaches and sand dune areas along the larger precursors of Erie, and Chippewa Lakes are of a similar character and form. Not many of them are waste at present, but

rather they are in demand. Wagon roads and electric lines follow them extensively eastward from Sandusky and Seneca counties, even beyond our commonwealth boundaries. Westward from the above named counties they are often under general farm crops or

the garden, but considerable areas in the four or five northwest counties are largely waste land. Scrub growth of willows, sumac and other plants are about their only crop, for hundreds of acres, and I am not yet ready to suggest a cure for this waste territory.

GUATEMALAN AGRICULTURE

James F. Zimmer, '09

It is very astonishing to a northerner when he goes south and sees the methods followed by the agriculturists in the tropical countries. One is impressed by the few acres of arable land actually under cultivation, and this land is tilled so poorly, not obtaining one-half of the produce such very fertile land would yield if taken care of as it should be. It made the writer

feel like he had stepped back in history to the time of John Smith, who probably farmed and lived on corn, ground between two stones, as these ignorant people are doing to this day. Smith's old rule, "He who will not work, can not eat," would surely be a blessing if it could be enforced in this country, but I suppose the intense heat makes the natives lazy, and the abundance of



Cultivation of Sugar Cane in Guatemala

fruits of all kinds makes them careless, because if they do not feel disposed to work the land they are sure of enough to eat anyway so they lay around in the shade and wait for the fruit to ripen.

Now, something concerning the crops raised in Guatemala. Corn is the staple crop of the country, as it was in "ante-bellum" days when the Indians were in possession. It is raised in about the same way, too, I think. A small place in the soil is loosened with a hoe and a couple grains dropped in. Some of the patches we saw were so stony the planter hardly had space enough to drop a grain so it would have soil enough to grow. In this kind of a field no cultivation could be given because the slope was so steep no plowing could be done, and some of the rocks are too large to get over. Then when the crop is matured the next obstacle is to get it down to market, which is not an easy one to overcome. A pack mule is loaded up with bags, perhaps three bushels are tied on his back, and he is started down the winding, stony path. Usually the Indian carries a bushel or two strapped to his back and sometimes his faithful wife brings up the rear with a good big basketful on her head. It is remarkable how these people can carry such loads on their head and the long distances they travel. When the corn is brought to the home or to market it is kept in a tree so the hogs cannot get at it. It is sold to the families a few ears at a time, and they use it in making their torteas (corn cakes). These form the chief diet of these people, and they are made by soaking the shelled corn in lye for one day to soften up the hard coat on the grain, then it is ground between two stones and made into cakes and cooked

by laying directly on the ashes and coals.

Sugar-cane is another one of the crops of that country; it is raised in the lower regions and usually along the streams where irrigation can be given to carry the crop over the dry season. It is raised about like corn and looks a little the same; the crop is cultivated by a plow drawn by an ox, because the horses are so small they would not be very serviceable in this work.

When the cane is matured, they cut off the blades with a big knife and the cane itself is loaded on an ox-cart and hauled to a cane mill where it is made into pinala, or real dark sugar. This sugar is left in solid hemispherical chunks or lumps, and wrapped in corn-husks and hauled to the little towns to market in this fashion.

Most of the sugar-cane plantations are owned by Spaniards and the work is done by the natives receiving about un peso (eight cents) a day for their labor.

Beans and peas are raised too, but not extensively at all. They have about the same kinds as grown here, and they raise a black bean that they consider very fine. It is very good, but on account of its unsightly appearance on the table it would not be very popular in America.

Potatoes are also grown, but they are of an inferior sort, only about one-half to one inch in diameter. They do not seem to care much for this tuber and, therefore, are not trying to improve it. Sweet potatoes are more of a success here, as the soil is more or less sandy along the streams. They are sold by the pound, the grower receiving about six cents per pound, but the market is very limited.

These people are lovers of stock and some of them have some good looking cattle, too. On account of the scarcity of fence material, the cattle usually run wild, but every owner has his stock branded, and the people are honorable enough to respect the brand. The cows are very seldom milked, but run wild and raise their calves, probably not seen by the owners for months at a time. Because of this mode of living, a struggle for existence, they have developed wonderfully long and sharp horns, which seemed very peculiar to us at first. They are used almost exclusively for beasts of burden, used for plowing, hauling the produce to market, etc.

The hogs of the land are not prize winners in the strictest sense, but are more like the Florida "razor-backs." They are the scavengers of the towns, and as a usual thing just run at random, in the houses and almost every place. Once in a while you find a family who does not want their pig to mingle with the rest, and so their's is tied with a rope to the house. In a few cases where the houses had board floors up three or four feet above ground, the pigs were penned under the house. It was very strange at first to have several pigs running around under the coaches and appeared to be waiting for the arrival of the train, as

(Continued on page 17.)

ROOT CROPS

Wilbur Elser, '09

The term "root crops" is used to apply loosely to a class of plants, mostly biennials, in which the food supply is generally stored up the first season, in the thickened stem, as nourishment for the knitting stem the second season. However, there are exceptions to this. In single species, such as the beet, there may be found individual plants that are annuals, and others that are perennial. In some instances, as in the common cabbage, the food supply is stored in the leaves, while in other cases, as in the kohlrabi, it is stored in the stem alone.

English agriculture is noted for its root crops. These crops become a regular part of rotation systems. There they thrive in cool, moist climates. In America they have not received the attention they deserve, especially in the northern states and Canada, although their value is more appreciated in the latter country than in the United

States. They afford good nutrient materials in most wholesome and digestible forms, and because of their succulence they become a good adjunct to dry and concentrated seeds.

For many years roots have been a standard crop for feeding purposes, especially in the production of mutton and beef. Their improvement and use for food for domestic animals appears to have arisen in the Netherlands, Germany, and other low-lying regions of northern Europe, in the fifteenth and sixteenth centuries. Although the common garden beet had been tried for stock feeding earlier, the improved mangel wurzel was introduced both into Europe and America about the middle of the eighteenth century. This class of crops has the advantage of furnishing very palatable succulent food which may be kept in perfect condition during the entire winter season,

an advantage which is not wholly measured by the actual amount of nutrients supplied by these materials.

A recent Cornell bulletin states that the reason the production of roots is of special interest to the stock seeders in the north Atlantic states is that these states raise a comparatively large amount of roughage and a small amount of concentrates, while in the North Central states a large amount of cereals or concentrates in proportion to hay and fodder is grown. Extensive Danish experiments have shown that the dry matter of mangel wurzels where fed in large quantities has a seeding value equal pound for pound to a mixture of the cereal grains, or to three-fourths of a pound of cotton seed meal when fed in such a way as to eliminate the influence of succulence. The dry matter is principally carbohydrate in character, although the proportion of protein is as large, and in some cases larger than in certain of the cereal grains.

One of the objections to roots as a food product lies in the fact that they are somewhat expensive to grow, and having a high water content necessitates the handling of large weights of water. A ton of turnips or mangels may furnish even less than 200 pounds of dry matter, and to secure this 1800 pounds of water must be handled several times. This limits the amount which may be fed, and it becomes of special importance where they are fed in connection with silage. Even should it be advisable for other reasons, on account of the high water content, it will not be practicable to feed a sufficient amount to entirely take the place of cereals.

Another serious handicap to the raising of root crops is the fact that under present cultural conditions, a large

amount of hand labor is required. However, while roots may not be economically raised to entirely substitute silage and other coarse fodders, yet it may be economically raised as a partial substitute for concentrates, especially the cereal grains, and for this purpose they are of value to the American farmer.

Root crops belong to several genera, the following of which are the more widely known: (1) Beta, including garden beets, sugar beets, and mangel wurzels; (2) Brassica, including turnips, rutabagas, kohlrabi, cabbage, rape and kale; (3) Dancus, including the carrot, and (4) Pastinaca, which includes the parsnip.

The first genera, perhaps contains the more important, if not the more common root crops. The beet is cultivated in four general forms, and in each of these forms there are many different varieties. These four forms are: (1) chard, its leaves being used chiefly for ornamental purposes; (2) the garden beet, which generally has a red colored flesh, and is used for cooking; (3) the sugar beet, generally with white colored flesh, and is cultivated especially for its sugar, and for stock feeding purposes; and (4) mangel wurzels, which are supposed to be a cross between the former two, and are used extensively for stock feeding.

The beet, while usually referred to as a "root" is really a modified stem and primary root closely united. A transverse section of the beet shows a series of concentric rings of fine tissue alternating with rings of softer tissue. The finer rings are said to be higher in dry matter, and richer in sugar than the intermediate rings, and it is claimed that the richest roots are those in which the rings of firm tissue are packed closely together.

Sugar beets differ from mangels in color, form, size, vigor of growth, ease of harvesting, total yield, and in keeping qualities. In mangel wurzels the color of the skin varies, while in the sugar beet it is white. The form is also variable, but the commercial varieties are usually divided into long, half-long, ovoid, tankard, and globe. Mangel wurzels should weigh from three to four pounds apiece, while the typical sugar beet weighs only about one pound.

The beets grow almost entirely below the soil, while in the case of the mangels only about one-half to one quarter of the root is below ground. For this reason the mangels are more easily lifted, yet more weight must be lifted in the end on account of their low percentage of dry matter. The roots of the typical sugar beet will contain from 18 to 20 per cent. of dry matter, about three-fourths of which is sugar, while good varieties of mangels contain only about 12 per cent. of dry matter, and only about one-half of this is sugar.

The beet is adapted to a cool climate, and a moist soil, and it is due largely to this fact that the sugar beet industry in Ohio is increasing. The southern shore of Lake Erie lies in the north and south center of a belt extending from the Atlantic to the Pacific, and, theoretically, this belt is best adapted to this industry. Sunshine is especially desirable where a high sugar content is desired, and hence some of the sub-humid western sections are well adapted to this industry.

Mangel wurzels are especially adapted to higher elevations of the North Atlantic States, where the short season, and the danger from frost, make maize growing somewhat uncertain. They

can withstand the drought better than any other kind of root crop.

Beets can be grown on almost any kind of soil, ranging from sandy to heavy loam, provided they are fertile and sufficiently deep. Beets may occupy the same place in a rotation, as is occupied by other intertilled crops, such as maize or potatoes. In Europe, root crops were first used to take the place of the bare fallow in the rotation. In this manner they were able to get a crop of roots and the land was rested practically as much as it otherwise would have been. Oats is the best grain to succeed the beets, since the beets cannot be removed in time for fall grains. On the other hand, the roots should succeed the wheat, since that crop is harvested early, and plenty of time for fall plowing is left.

In the preparation of the soil, greater care is necessary for sugar beets than for the cereals. Deep fall plowing is especially advisable, and cross plowing or disking in the spring is recommended, as the seed bed must be made very fine.

In case the beets are to be used for making sugar, the crown is always cut off, put where mangel wurzels or beets are stored for feeding; the tops should be twisted off by hand. Storing should be done as early as possible, since if allowed to lie long on the ground a loss in sugar content results from fermentation. Two conditions are essential for the storage of roots without deterioration—a low temperature as near freezing as possible, and abundant ventilation. Experiments show that at a temperature of 32° F. beets may be kept in perfect condition for a long time. While a root cellar is the most convenient, yet it is not necessary, as the storing may be done by pitting,

covering with alternate layers of straw and soil, adding layers as the cold weather increases.

It is not considered advisable to feed mangel wurzels to live stock until after they have been stored some time, as they appear to contain some substances which are laxative, this characteristic disappearing after they have been stored for some time. Before feeding, manzel wurzels and sugar beets should be pulped, sliced or cut into finger pieces. Frequently this is done some time before required, and mixed with a low grade hay or straw and thereby adding to the palatability of the latter

Not only are sugar beets grown for stock food, but also for the making of sugar, and the manufacture of beet sugar is now offering the farmer two waste products, sugar beet pulp and sugar beet molasses. The pulp is the extracted beet tissue from which all the sugars and other soluble compounds have been removed. Experiments at Cornell University indicate that it is worth about one-half as much as corn silage for feeding purposes, but that it is useful as a succulent food, and may be fed to advantage in quantities from 75 to 100 pounds daily to full-grown animals, provided it can be



This is the "Oud Bussum" certified dairy farm, operated by Exploitatie Moatschappy, near Amsterdam. The Queen of Holland holds the controlling stock. It is the finest dairy farm in Europe. They sell milk to Amsterdam, Rotterdam, The Hague and some to Paris.

purchased at a price proportional to its value.

Among the other root crops which may be classed as more important may be mentioned turnips, rutabagas, kohlrabi and cabbages. These also require a cool, damp, rather dull climate, and sunshine is not so important as in the case of sugar beets, and neither will they withstand drought so well as mangel wurzels. As a rule they require sandier soils than beets, turnips especially. The preparation of the soil, the cultivation and the harvesting and storing of the crops are similar to mangel wurzels and beets.

Their place in the rotation is also similar to that of beets and mangel wurzels. The common turnip, which is the leading root crop of Canada for stock feeding, is valued as a catch crop, and it may be used for feeding on the ground early in the season, and so, as has been previously stated, while root crops may not be economically raised as a substitute for silage and other roughage, yet they are very essential as a succulent food, and may be economically raised as a partial substitute for concentrates, especially the cereal grains.

THE GULF COAST TEXAS

W. G. Yeager

After riding on a train from Columbus, Ohio, to Dallas, Texas, in a continuous rain and a temperature much more disagreeable than real winter itself, it was with much delight that I stepped off the train in the Falfurrios country, a land of sunshine, winter vegetables, palms and prosperity. Being anxious for information of the Falfurrios country the writer took advantage of a short spring vacation to visit this great country, for that it surely is. Having traversed twenty odd states during the past four years in a study of horticultural conditions, I find none that offers as many opportunities for making money on an equal investment as does this Gulf Coast country. The soil varies from the heavy black land, so suitable for onions (Bermuda) and asparagus, to the loams and light sandy loams, the ideal vegetable land; the tropical climate and artesian water make this nearly an ideal vegetable

country, and not vegetables alone for the tropical fruits that have been set indicate that this Gulf Coast country is certain to become a fruit country of no little note—especially oranges and grapes (the Spanish and California grapes).

This particular country presents quite a contrast to the South in general, in that instead of the large plantation embracing hundreds and thousands of acres on which negroes do practically all of the manual labor, the ten to forty-acre farm is the condition as existing at present. These small farms are owned and worked almost entirely by Northern people who have gone South, many in search of a more genial climate.

The Mexicans do most of the manual labor; they are quite plentiful and are said to be fair workers when in company with some one of a higher rank. The bulk of the work is done on

piece contract. Mexican laborers can be readily secured at seventy-five cents a day, American money.

The vegetables are practically all grown during the winter months. The seeds are sown during October and November, harvesting being about the holidays with the short-season vegetables, and continues up to about April 1st with the Bermuda onions, cabbage, potatoes and green beans. The land is then cleared off and planted to cotton, water melons or cow peas as the case may be. The watermelons and cow peas are off in time to produce a crop of early fall vegetables before starting the regular winter crop. The artesian wells flow 100 to 200 gallons water (80° F.) per minute, which is sufficient to irrigate 4 to 8 acres of land in vegetables with a 10 H. P. gasoline engine attached. The irrigation acreage from one well can be increased to 30 or 40.

Alfalfa, with plenty of water, grows luxuriously, producing 8 to 12 tons hay per acre per year. The vegetable crops being produced at a season of the year when the North is in the firm grip of winter, find a ready market, netting the grower from \$100 to \$200 per acre.

With the exception of a few cereals I found growing and flourishing every crop that is being grown in the temperate climate of the North. The abundance of wild game affords an endless amount of real sport during the hunting season.

The climate of this section is semi-arid and semi-tropical. Being semi-arid there is no waste or failure from excessive rains. On account of the semi-tropical climate something is being harvested every month in the year.

The heat of the summer's sun is tempered by the daily winds from the Gulf of Mexico less than thirty miles away. This breeze comes sweet and cool, saturated with the bracing ozone of the salt waters, eliminating entirely the sultry days and stifling nights so common in late summer in the temperate climate. The water as it comes from the artesian wells is delightful for bathing, and delicious to drink, being as pure and sweet as water can be. Bees are kept with considerable profit, especially in the vicinity of San Antonio, this country being widely known as one of the honey-producing centers of the United States.

San Antonio, the metropolis of Texas, the most beautiful city in the State, and said to be one of the most healthful cities in the United States, is worthy of mention, and should not be overlooked by a tourist when within the State. The planting of trees and shrubs (flowering) about the parks and residences have produced an effect far superior to anything that has ever been seen in a Northern city.

The true southern hospitality must be tasted to be appreciated, and then very favorably impresses one coming from a country where individuality, rather than hospitality, is the custom.

One traveling across the State of Texas is reminded of the statement made that Texas has almost every variety of climate, soil and product that is found in the United States.

This Southern country seems to be one of great resources and wonderful possibilities.

CONTROL OF FIELD INSECTS

T. H. Parks, '09

Among the many problems which the American farmer of today has to encounter arises the important and troublesome question of combating our field crop pests.

While we know the losses from these insects are great, yet it seems to be considered by the average tiller of the soil as a necessary and irretrievable loss- and no immediate inspiration urges him to rise up against these intruders. The annual loss due to the corn root worm alone is 2%, or \$20,000,000. Insects damage the corn crop annually to the amount of \$80,000,000.

It has been estimated that the damage due to the chinch bug in Illinois in one year was \$73,000,000.

These figures are no small item, and immediately command the attention of the farmer as to how he can avoid the consequence of this plunder.

One of the first requisites is a working knowledge of their habits. He must be able to distinguish the common field pests in their stages of development, and their different ways of attacking and devouring crops.

Almost every insect has a weak "link" in the "chain" of its life, where it can be reached and destroyed, and it has become necessary for the farmer of today to find their weakness and take advantage of it.

The horticulturist has, and is now taking advantage of this more than the general farmer, because his crops extend over less areas, and he has ample time to apply his remedy during the critical period.

The general farmer, on the other hand, cannot spray his whole crop, and

consequently must use preventive measures as far as possible. Prevention is better than cure for him. Indeed with a few of our worst scourges, preventive measures are the only successful methods and in every case the most efficient. The farmer cannot hope to give his entire attention to individual suppression, but should use his efforts in suppressing as far as possible, in one operation, those pests that have like habits and their weak stages coincident.

Various methods are extensively practical as preventives and barriers against insects, and these will be treated of separately and roughly, bearing on their respective merits and value.

1. Crop Rotation.

This is considered very essential, and a decisive method of dealing with many destructive foes.

Insects have become so fixed in their habits that they cannot encounter a sudden change without fatal results. This change is never brought about in nature, and when the farmer suddenly replaces one crop with another of different variety, he either succeeds in starving the pests, or causing them to migrate, in doing which, they are often overcome and perish, or, in the case of wingless females, are unable to migrate at all. The Hessian fly and wheat midge are effectively combated in this way, and thus it is seen that a change of wheat crop from field to field is very advantageous. We have another example in the case of the corn root worm. The eggs of this insect are laid in the fall, on the roots of corn, and in the spring the young larvae hatch

and devour the new roots, and greatly damage the corn. It has been proven that they are only troublesome where corn is grown year after year on the same ground. The rotation should be carried on in such a way that no single crop, or any two closely-related crops, succeed each other.

The rotation method may sometimes be ineffective, or even disastrous. This is sometimes shown where a change from grass to grain crop is suddenly made. The farmer who destroys the grass plants, and attempts to grow corn, may find his corn suddenly laid

to waste by the hungry, half-starved grass insects, which have not yet perished. This can be avoided by late fall or winter plowing, which forms our second combating method.

2. Summer and Fall Plowing.

Mid-summer plowing is very effective in some cases. This is especially true of the clover root borer, which is a white grub burrowing into the root, and causing the plants to wither and die out in spots, in July or August. If the clover is plowed up after the hay is cut, and when the insect is noticed, it destroys these pests and prevents their



A Pretty Roadway

spread to other fields. This seems to be the best production from these ravages.

As we found under rotation, fall plowing is very effectual when old grass fields are farmed. Here we kill out the cutworms, wireworms and grubworms, all of which are too well known, and probably cause four-fifths of the annual loss of our corn crop.

3. Preparation of Soil.

Thoroughly preparing the soil is a valuable way of fighting insects. A healthy plant will sustain an injury that a less vigorous one will not. This is true in animals just as in the case of plants, and for the same reason that a healthy colt will have greater chances of recovering from a disease than a stunted or sickly one.

So then every means that is in the farmer's power should be taken to keep his field of grain growing and healthy. Thorough preparation of his seed bed is probably the best he can do for his crop, and should be given much attention.

Then it has been found that stirring the soil between plowing and planting destroys nests of certain ants, that harbor the corn root louse, which is so disastrous to the roots of corn.

4. Weeds and Rubbish.

Where volunteer plants and rubbish of all kind is allowed to collect, the chances for hibernation and consequent losses from insects is increased. The chinch bug has been known to hibernate in old dead grass and weeds, while the timothy joint worm, which is probably the worst enemy of our hay crop, is almost always absent where proper care is given fence corners, ditches and other generally neglected places.

The care of the premises has its

value, and the labor required to make well-kept premises is not badly spent, but will repay the owner in the end.

This completes, in a rough way, a few of the most important methods by which the farmer can deal with his field crop pests in a wholesale manner, and while this question is one of the many that arises before the producer of today, it deserves due consideration and should go hand in hand with the fertility, moisture or labor problems.

GUATEMALAN AGRICULTURE.

(Continued from page 9.)

all the inhabitants come down to the stations to see the incoming passengers.

There are not very many horses in this region and the ones there are very small and scrubby looking. It seems that a mule is more serviceable and sure footed for traveling over the mountains, so they are used a great deal; everyone rides on horseback as the roads generally are impassable for a vehicle of any sort.

Goats also run in great herds and clean up almost everything in their path. I do not know as they are used particularly for anything. Perhaps their milk is used for making cheese, as we had cheese in the hotels several times. They probably use their hides for making a sort of bed, as most of the people sleep on a cot and use these hides for blankets.

On account of the mostquitoes and poor water the better classes of farmers are kept out of this exceedingly fertile territory, for no one cares to imperil his life when malarial and yellow fever are so prevalent, by living in this sort of an uncivilized and unorganized land.

THE AGRICULTURAL STUDENT

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M. D. Moore	H. E. Allen
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M A Y

Columbus is going to have another work-horse parade. As was the case last year, Prof. Plumb is the "pusher," and we are proud that the movement emanates from a University man. All things now point toward a bigger and better parade this year than the one last year.

The appropriation made this year for the Agricultural College is, as shown on the following page, only \$9,000. This seems to us to be exceedingly low for a State ranking among the first in her agricultural interests and boasting of over \$200,000,000 worth of live stock. When this is compared with the appropriations in other states it makes us feel that Ohio is not taking her proper place among other states in furthering agricultural education.

We are publishing on another page the constitution of the Student Union. Alumni and ex-students will notice from this that they may become members of this Union and at the same time receive the Agricultural Student for a year all for the regular price of the paper. The improvement of the paper in the last year has been a big step in the right direction, and now let's get to work all together and make of the paper what Ohio's Agricultural College paper ought to be—better than that of

any other agricultural college. Send us the subscriptions of a half dozen of your neighbors along with your own, and you will be glad that you have helped your Agricultural College, your neighbors and yourself.

It seems very probable that if the present Congress does not pass the drainage bill, the next one will. The bill has already passed the Senate and the question of its passing the House depends, with very little doubt, upon whether or not it is brought up at the present session. There are in the United States a little over 75,000,000 acres of swamp land which, were it made available to the farmer, would rival the irrigated lands in richness and in value. Swamp reclamation will not appeal to man in the same way that irrigation does, for it does not promise the grandeur of effect. But the work will probably be more beneficial than irrigation for the desert land is wholesome, while the swamp lands breed pests of many kinds and their drainage will result in great good along this line.

University News and Alumni Notes

The National Corn Growers' Association meeting will be held in Omaha, December 9-19, 1908. The different states are co-operating through local corn improvement associations. Prof. Shoemith has been made chairman of the committee to look after the interests of Ohio corn growers.

The Agricultural Society met April 15. W. L. Elser, the new President, took the chair. A most interesting and enjoyable talk was given by "Doc" White of the Veterinary Department on his school days. Hendricks read an excellent paper on "Corn By-products."

Thursday afternoon, April 16, the "Ags" played and won their first game. The Pharmacists were defeated by a score of 12-6. "Tom" Jones, pitching for the "Ags," had things his own way every minute of the game.

J. F. Barker is Assistant in Soils at Iowa State College and has had charge of Soils Physics Laboratory since the beginning of the year. He expects to spend the early part of the year in the U. S. Department of Agriculture at Washington to familiarize himself with their chemical apparatus, and the remainder of the summer at Iowa State Experiment Station.

The University enjoyed a visit by Dr. Carl C. Gay during the week of April 19. Dr. Gay is now connected with the Pennsylvania State College.

O. M. Johnson, '08, has accepted a position with the German Koli Works.

Mr. J. B. Parker, who has been taking graduate work here the past year, has accepted a position as Assistant Entomologist at the Kansas Experiment Station. He will work with insects affecting staple crops.

Mr. C. F. Jackson, A. M., '07, who has been Assistant in Zoology here, has accepted the position of Assistant Entomologist at the New Hampshire Experiment Station, and will take up his work there in June.

Mr. N. E. Shaw, '06, has been appointed Chief Inspector of the Division of Nursery and Orchard Inspection in the Ohio State Board of Agriculture.

Mr. A. J. McCrav '08, has accepted a position in the Bureau of Entomology,

Division of Apiculture, at Washington, D. C. He began work there about April 15. He will have charge of the experiments in bee keeping.

Dewitt Wing, Associate Editor of the Breeders' Gazette, who is making a trip to the New England States, stopped at the University on May 5 to visit friends.

We are glad to report that Bob Wilbur, '09, who has been sick at his home with a light attack of typhoid fever, is improving nicely.

C. S. Woodard, '08, will have charge of the beef cattle at Booker T. Washington's Tuskegee Institute in Alabama.

Appropriations made by the last Legislature for the Ohio State University:

Equipment and heating for Woman's Dormitory.....	\$15,000
Equipment of Engineering Laboratory	20,000
Equipment agricultural buildings	5,000
Equipment School of Mines building	9,000
Equipment Chemistry building.	10,000
Equipment Agricultural Chemistry Laboratory.....	4,000
Equipment Bacteriological Laboratory	1,000
Equipment Veterinary Medicine	1,500
Power house	12,500
Veterinary Clinic, building and equipment	90,000
Fireproof Chemical storeroom..	10,000
Encouragement and improvement Dairy industry.....	2,500
Tunnel to Mechanical Laboratory	6,300
Construction and equipment of Students' building; plans to be approved by an honorary commission of five to be appointed by the Governor, and who shall serve without compensation	75,000

CONSTITUTION OF THE OHIO AGRICULTURAL STUDENT UNION

Purpose.

The purpose of this Union shall be to supply a bond that shall unite ex-students and alumni of the College of Agriculture of the Ohio State University, and promote good fellowship, college loyalty; and general interest in agricultural education and experimentation.

Membership.

Those who have been or are instructors at the college, members of the experiment station staff, and all persons who have been enrolled in any of the courses offered by the College of Agriculture of the Ohio State University, at any time, shall be eligible to membership, and shall become members, upon payment of the regular dues.

Officers.

The officers of this Union shall be a President, a Vice-President and a Secretary-Treasurer, who shall perform the duties usually incumbent upon such officers.

There shall be a Committee on College Affairs, consisting of three members of the Union. The term of office shall be three years. At the first election one shall be elected for one year, one for two years and one for three years. Succeeding elections shall be for three years. The duties of this committee shall be to make recommendations for the good of the general work of the College of Agriculture of the Ohio State University. There shall be a committee on Necrology, consisting of three members, elected annually, whose duty it shall be to report the deaths of members of the Union.

There shall be an official representative, whose duty it shall be to keep the members informed of the doings of the Union, through the official publication, the Agricultural Student.

Meetings.

There shall be an annual meeting, to be held at Columbus, during the week of the State Agricultural meetings in January, to be arranged for by the officers. Special meetings may be called at any time by the officers of the Union. Fifteen members shall constitute a quorum.

Elections.

The officers of this Union shall be elected by ballot at the annual meeting. Nominations shall be made by a regular committee of three, appointed by the President at each annual meeting to report at the next annual meeting. Not less than two nominees shall be named for each office.

Dues.

The dues shall be fifty cents annually, and all members shall receive regularly the Agricultural Student, which shall be the official publication. Persons eligible to membership who shall pay into the treasury \$2.50 shall become life members, and shall receive the official publication each month for five years.

Amendment.

This constitution may be amended by a two-thirds vote of the members present at any regular meeting.

H. C. Price,
M. O. Bugby,
John F. Cunningham,
Committee.



"I Think I'll Be a Farmer-Man"

STUDENT DAYS

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It has several different features that cannot be found in any other cream separator.

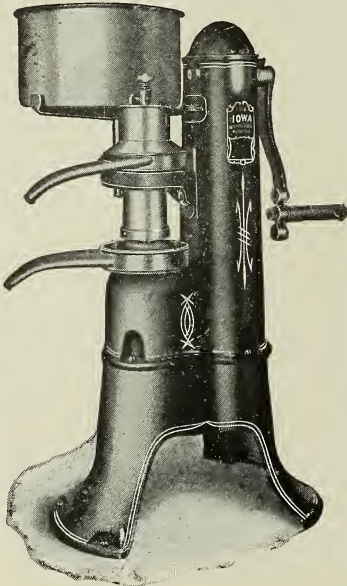
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Are you sure that you are getting the very best service in the handling of your live stock? Anyone can sell live stock, but only a very few of the best and highest-paid salesmen in the business have that broad and intimate knowledge of men and market, that inborn talent for trading, that count so heavily in the shipper's favor.

Those that are so equipped stand at the head of their profession, and are the sort of salesmen which compose our staff. They know how to get "the last nickel"—and IT'S THE LAST NICKEL THAT COUNTS.

R. B. Wyatt, Reserve, Kansas, writes our Kansas City house: "I want to thank you for the interest you took in selling my yearlings. You certainly worked hard to get that other nickel, and I am well pleased and appreciate same."

W. B. Widman, Bigelow, Minn., writes our Sioux City house: "Your sale of car of hogs made for me was very satisfactory. They were well sold considering the condition of the market. I hope some time to have more stock for you to sell for me. I know you are very competent to get good returns for all hogs I may ship to you."

F. W. Merrill, Kaneville, Ill., writes: "I am well pleased with your sale of my cattle. They were on feed only ninety days and gave me a margin of \$1.85 per cwt. I consider them well bought and well sold and shall consign my next shipment to Clay, Robinson & Co."

Lonnie Rummel, Swanington, Indiana, writes: "I am this morning in receipt of the load of lambs you bought for me and am well pleased with them. They surely are a good lot."

B. B. Baker, Monticello, Indiana, writes: "I wish to thank you for the last two cars of feeding sheep you sent me. They were exactly what I wanted. I think this last lot made you some customers in this vicinity as two parties have promised me to order from you."

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Two Years Old and Under Three		2nd. 5th.
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Champion Stallion.

Reserve Champion Stallion.

Champion Group of Five Stallions owned by one exhibitor.

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Three Years Old and Under Four		1st.	2nd.	

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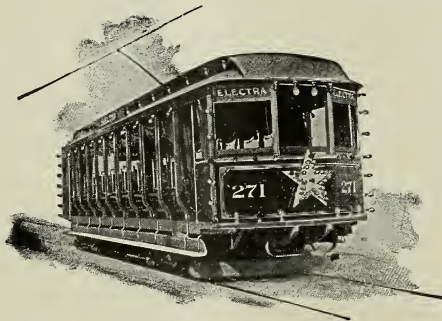
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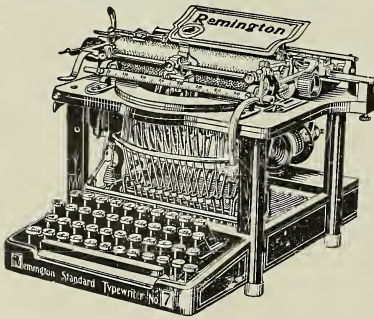
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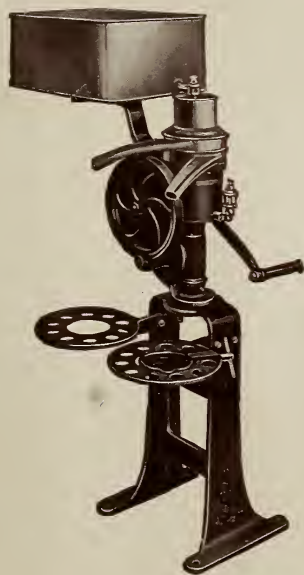
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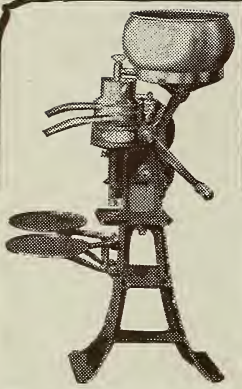
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